

MP1595A

40G SDH/SONET Analyzer





All-in-one Model Supporting 40/43G Jitter & Wander Measurements

All-in-one Multibit Rate Analyzer

Core networks are adopting 40G speeds to support cloud computing applications and faster mobile phone applications. In addition, plans are advancing for upgrading submarine fiber cables from 10 to 40G. The spread of 40G networks across many business sectors is driving the need for reliable jitter measurements to assure the interoperability of the various types of network equipment. The MP1595A 40G SDH/SONET Analyzer is the ideal solution for network quality measurements.

STM-256/OC-768, OTU3 Support

Just one MP1595A Analyzer provides full 40/43G support for all network quality measurements.

All-In-one 1.5M to 43G Multibit Rate Support

This all-in-one flagship model for SDH/SONET and OTN measurements supports the following Multibit rate.

Electrical interface	PDH	2.048, 8.448, 34.368, 139.264 Mbit/s
	DSn	1.544, 44.736 Mbit/s
	SDH/SONET	51.84, 155.52, 9,953.28, 39,813.12 Mbit/s
	OTN	10,709.22, 43,018.41 Mbit/s
	Non frame	10,312.5 Mbit/s
Optical interface	SDH/SONET	51.84, 155.52, 622.08, 2,488.32, 9,953.28, 39,813.12 Mbit/s
	OTN	2,666.05, 10,709.22, 43,018.41 Mbit/s
	Non frame	10,312.5 Mbit/s

Full SDH/SONET, OTN Measurement Functions

Stress testing for SDH/SONET and OTN Equipments is supported using the full line of versatile functions, including overhead setting, monitoring, error/alarm generation and detection functions. The random error insertion using a Poisson distribution is especially useful for evaluating FEC performance of OTN as recommended by ITU-T.

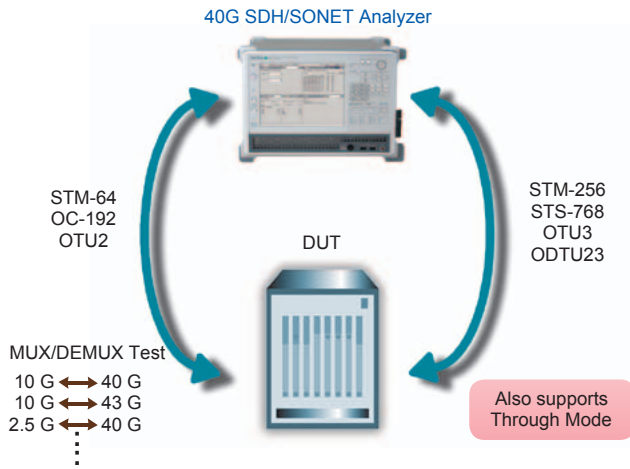


Key Measurement Applications

SDH/SONET/OTN Measurement Solutions

The following measurement solutions required by 40/43G transmission equipment and networks are supported:

- Error/Alarm Insertion and Detection
- Pointer Increment/Decrement Test
- APS (Automatic Protection Switching) Measurement
- Frame Memory/Capture
- Through Mode Measurement
- Delay Time Measurement
- Monitoring Function

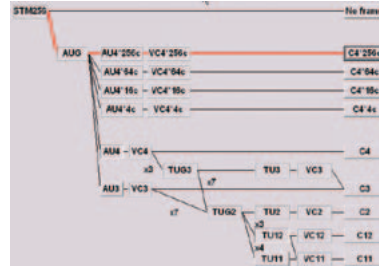


A single MP1595A unit supports a wide range of bit rates from 1.5M to 43G, offering an efficient measurement test platform for MUX/DEMUX equipment with 2.5G and 10G interfaces as well as 40/43G transmission equipment and networks.

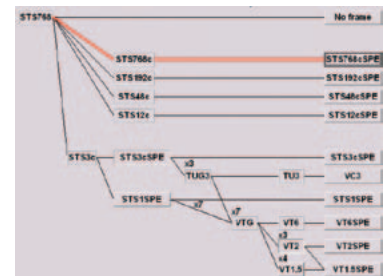
Mapping Support

Mapping Support (SDH/SONET)

Concatenation mappings from STM-1c/ STS-3c to STM-256c/STS-768c can be set. In addition, using the MP1595A with either the 10G Measurement Unit (MU150100A) or the 10G E/O, O/E Unit (MU150135A) offers support for SDH/SONET, Japanese, European PDH, and North American DS_n mapping routes for bit rates from 1.5M to 10G.



SDH Mapping

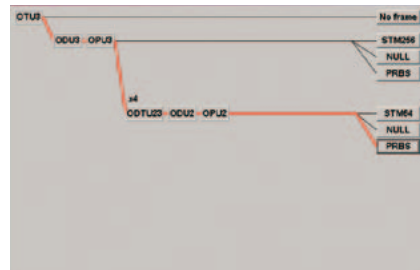


SONET Mapping

Mapping Support (OTN)

(MU150140A-05 OTU3, MU150140A-06 ODTU23)

The following ITU-T G.709 mappings are supported for OTN (43G), and the ODTU23 mapping can be supported as an option. Moreover, STM-64/STS-192 signals can be mapped to OTU3 signals as client signals.



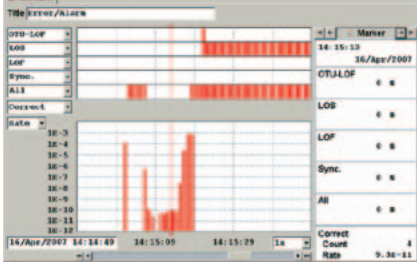
OTN Mapping

- *: Client-side SDH/SONET supports following OT3 mappings:
- OPU3: STM-256c/STS-768c
 - OPU3-ODTU23-OPU2: STM-64c/STS-192c

SDH/SONET, OTN Measurement Functions

Error/Alarm Measurement Function

For stress testing SDH/SONET and OTN devices, errors such as FAS, BIP-8, B1/B2/B3, etc., and alarms such as LOF, LOM, AIS, etc., can be generated at any timing and counted (monitored) by the MP1595A.



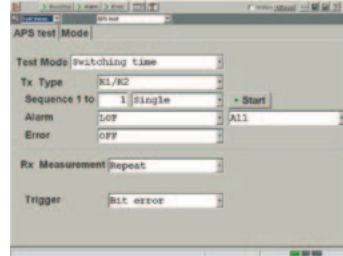
Error/Alarm Measurement Example (monitoring)

Alarm	Second	Error Count	Display data
HP(AU)	0	Bit	0
LOF	0	B1	3
OOF	0	B2	0
AIS	0	REI	0
RDI	0	Frame	0

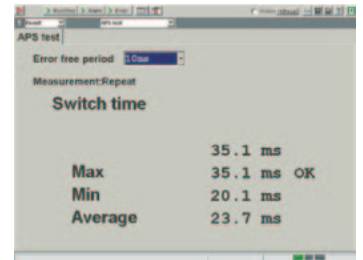
Error/Alarm Measurement Example (result)

APS Measurement Function

The Automatic Protection Switch (APS) test verifies the switching time with 1 ms resolution by measuring the time. Until the abnormal status is released when an alarm or error is triggered. This function checks that the switching time meets the specifications.



APS Measurement (setting)



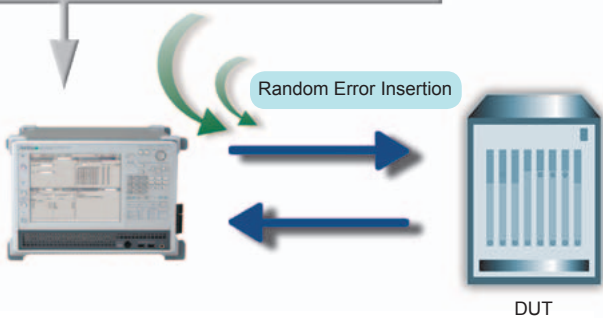
APS Measurement Example

FEC Measurement Function using ITU-T O.182 Random Error

The error signal (generated by Poisson distribution) specified by ITU-T O.182 is used to evaluate and verify the FEC performance in accordance with the ITU-T-recommended procedure. In addition, generation of burst bit errors of more than 1024 bits is useful for confirming the FEC burst error correction performance.

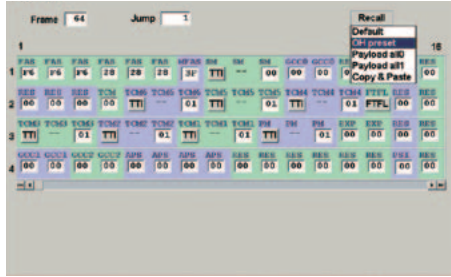
Random error insertion using O.182 method

This function is required for FEC evaluation. Accurate measurement was impossible using previous error insertion methods.

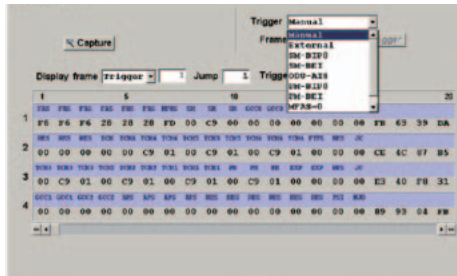


■ Frame Memory/Capture Function (MU150140A-10 Frame Memory/Capture 40/43G)

All data (OH, Payload) for a maximum of up to 16 frames can be captured using the frame capture function. Since frames can be captured using various errors and alarms as a trigger, this function can be very useful for analyzing data at abnormalities.



Frame Memory



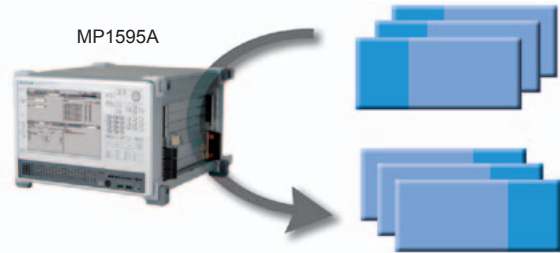
Frame Capture

■ Through Mode Function

The Through mode is convenient for SDH/SONET and OTN tests because it supports monitoring of signal quality on an in-service network as well as insertion of various errors and alarms.

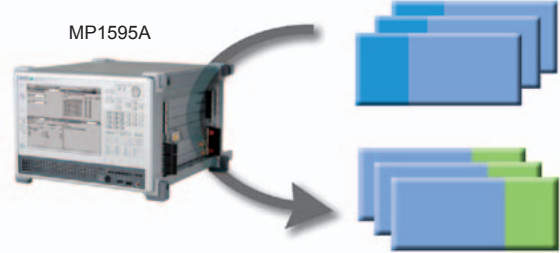
■ Transparent Mode

This mode loops-back and outputs the received signal as is. And random error insertion is useful for emulating transmission paths.



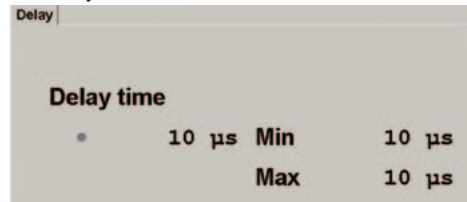
■ Overhead Overwrite

This mode loops-back and outputs the received signal after overwriting the OH part of the received signal with the OH specified by the MP1595A. Various errors and alarms can be inserted into an in-service line too.



■ Delay Measurement Function

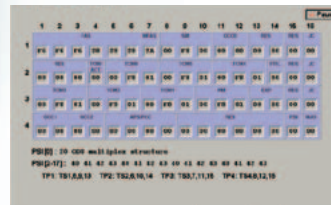
Network delay times are directly related to network quality and this function can measure payload data transmission delays with μ s accuracy.



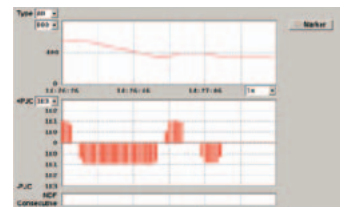
Delay Measurement Function Example

■ Monitoring Function

A versatile line of monitoring functions, including errors/alarms, pointers, OH, etc., supports comprehensive network monitoring.



OH Monitoring

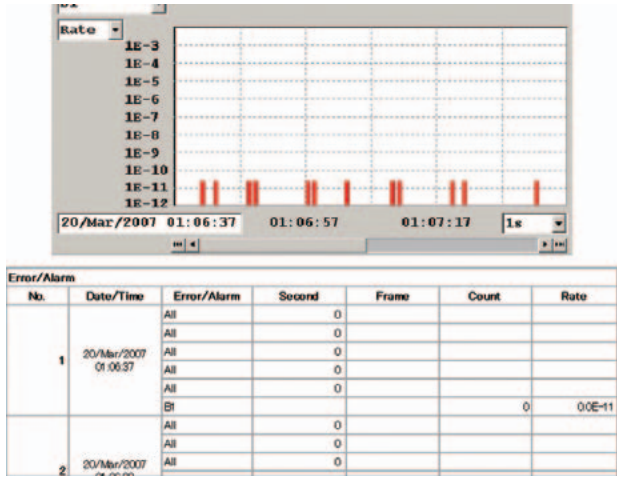


Pointers Monitoring

Useful Functions

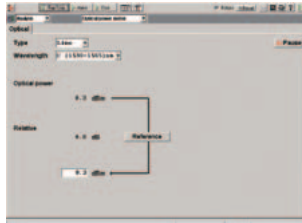
Reporting Function

Measurement results can be saved in various formats. Outputting results including graphs, measurements, etc., in HTML is convenient for creating reports.

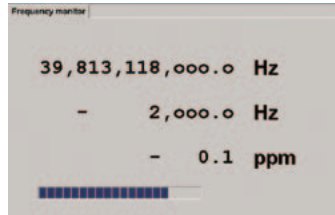


Optical Level/Frequency Monitoring

Optical level and frequency monitoring functions are standard, making it easy to verify the input signal.



Optical Level Monitoring



Frequency Monitoring

Troubleshooting

The MP1595A new jitter modules support new troubleshooting functions and extra inputs/outputs for new purposes.

Demod. Output (Option) and Spectrum Analysis Function (Option)

Outputs demodulated jitter analog waveform. In addition, it displays spectrum analysis results on the MP1595A screen without a spectrum analyzer.

1/4, 1/16 Clock Output

Outputs 1/4 or 1/16 clock synchronized with Tx clock. This can be used with a sampling scope as a Tx waveform confirmation trigger because this clock is free of jitter modulation.

1/64 Clock Output1, 1/64 Clock Output2

Outputs 1/64 clock synchronized with Tx clock. This can be used as a clock source for a DUT requiring a reference clock because this clock is free of jitter modulation.

Wideband clock offset

±100 ppm Tx clock offset. In addition, the Rx side supports jitter analysis up to ±100 ppm supporting DUT frequency tolerance tests.

Remote Control

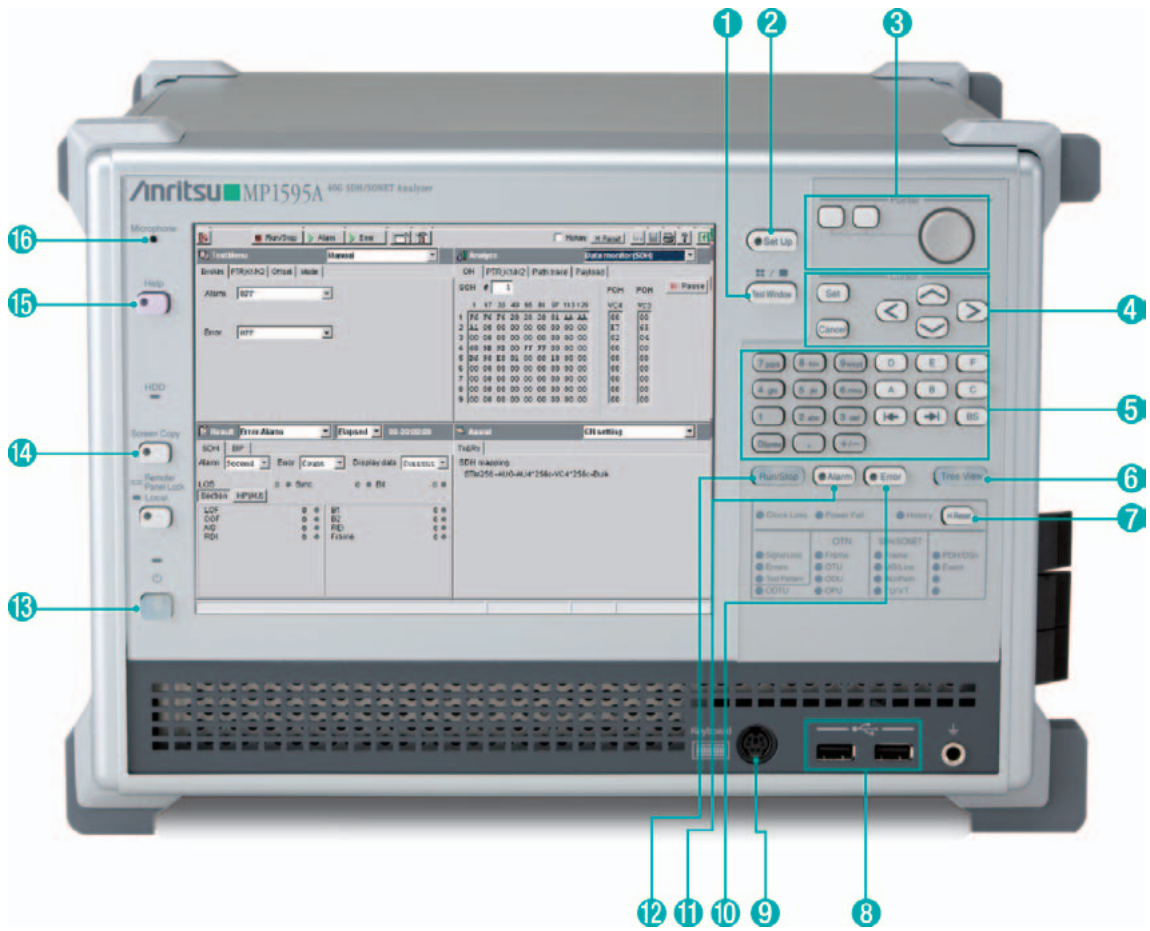
The optional MX159501A Remote Control Software package supports remote control of the MP1595A from a PC using the same GUI as the instrument.

Pointing Device/USB Interface

The compact main frame includes a display, keyboard and pointing device for all-in-one operation but two USB ports are also included for connecting a mouse and USB storage device to save measurement results when necessary.



MP1595A Key Layout



- 1 **Test Window:** Switches Test window screen between full and 1/4 split screens.
- 2 **Setup:** Switches between Setup and Test window screens.
- 3 **Pointer:** Same function as mouse.
- 4 **Cursor**
 - Set:** Sets data.
 - Cancel:** Cancel data setting.
 - ∨ ∧ < >: Scrolls screen cursor.
- 5 **Keys:** Inputs data
- 6 **Tree View:** On/Off for Tree View area
- 7 **H.Reset:** Resets history data
- 8 **USB Connector:** Connector for USB devices.
- 9 **Keyboard:** Connector for external keyboard.
- 10 **Error:** Starts/stops Error insertion.
- 11 **Alarm:** Starts/stops Alarm insertion.
- 12 **Run/Stop:** Starts/stops measurements and tests.
- 13 **Power:** When the Power lamp is on, the MP1595A quits and automatically changes to Standby. In Standby condition (Standby lamp on), MP1595A application software can be started and operated.
- 14 **Screen Copy:** Copies the displayed screen to a disk file.
- 15 **Help:** Displays the Help screen
- 16 **Microphone:** Microphone for order wire
- 17 **Trigger**
 - In:** Input connector for external trigger to control APS test and capture.
 - Out:** Output connector for error/alarm and capture trigger.
- 18 **Power (Main power):** Switches MP1595A power on and off.
- 19 **CLK Source**
 - In:** Reference signal input connector for synchronizing the transmission signal with an external reference signal.
 - Out:** Reference signal output connector for synchronizing the transmission signal with an external reference signal.
- 20 **RS-232C:** RS-232C remote control interface.
- 21 **Ether:** 10BASE-T/100BASE-TX Ethernet remote control interface.
- 22 **GPIB:** GPIB remote control interface.
- 23 **VIDEO:** Connector for external VGA display.
- 24 **DCC/GCC:** Connector for data/clock input/output for DCC (SDH/SONET), GCC (OTN byte) or Add/drop data.





Specifications

■ MP1595A 40G SDH/SONET Analyzer

Clock Source Input	<p>Frequency Clock: 1.544 MHz, 2.048 MHz, 64 kHz + 8 kHz, 5 MHz, 10 MHz Data: 1.544 Mbit/s (BITS), 2.048 Mbit/s</p> <p>Input Range: ±50 ppm</p> <p>Level/Code 1.544 Mbit/s: ANSI T1.403 (B8ZS) 2.048 Mbit/s: ITU-T G.703 Table7 (HDB3) 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz: TTL (Rectangle, Sine Wave) 64 kHz + 8 kHz: 0.63 to 1.1 Vo-p (AMI, 8 kHz violation)</p> <p>Connector 1.544 MHz, 2.048 MHz, 2.048 Mbit/s, 5 MHz, 10 MHz: BNC (75 Ω) 2.048 MHz, 2.048 Mbit/s, 64 kHz + 8 kHz: SIEMENS (120 Ω) 1.544 Mbit/s: BANTAM (100 Ω)</p> <p>Effective SDH/SONET/OTN Bit Rate</p>
Clock Source Output	<p>Frequency Clock: 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz Data: 1.544 Mbit/s (BITS), 2.048 Mbit/s</p> <p>Level/Code 1.544 Mbit/s: ANSI T1.403 (B8ZS) 2.048 Mbit/s: ITU-T G.703 Table10 (HDB3) 1.544 MHz, 2.048 MHz, 5 MHz, 10 MHz: TTL (Rectangle)</p> <p>Connector 1.544 MHz, 2.048 MHz, 2.048 Mbit/s, 5 MHz, 10 MHz: BNC (75 Ω) 1.544 Mbit/s: BANTAM (100 Ω)</p> <p>Effective SDH/SONET/OTN Bit Rate</p>
Trigger	<p>Trigger Input: For Capture/APS Measurement</p> <p>Trigger Output: Transmit Error/Alarm, Receive Error/Alarm, Capture Trigger</p> <p>Level: TTL (Active High)</p> <p>Connector: BNC (75 Ω)</p>
DCC/GCC	<p>Data Input/Output: D1-D3 (192 kbit/s), D4-D12 (576 kbit/s), GCC0-2 (13124 kbit/s, 326.7 kbit/s)</p> <p>Clock Output: 192 kHz, 576 kHz, 13124 kHz, 326.7 kHz</p> <p>Level: V.11</p> <p>Connector: D-sub 9 pin</p>
Remote Control	<p>Remote control using LAN (10BASE-T/100BASE-TX) with MX159501A</p> <p>Remote command control with RS-232C (MP1595A-01) or GPIB (MP1595A-02) or LAN (MP1595A-03)</p>
Peripheral Connection	VGA Output (SVGA), USB (2 port, Rev. 1.1), Keyboard (PS/2)
Pointing Device	Moves cursor on screen using mouse, etc.
Display Size	8.4-inch, Color TFT (800 × 600)
LED	<p>OTN: Frame, OTU, ODU, OPU, ODTU</p> <p>SDH/SONET: Frame, MS/Line, AU/Path, TU/VT</p> <p>Standby, HDD, Clock Loss, Power Fail, History, Signal Loss, Errors, Test Pattern, PDH/DSn, Event</p>
EMC	EN61326-1, EN61000-3-2
LVD	EN61010-1
Power and Power Consumption	100 V (ac) to 120 V (ac) / 200 V (ac) to 240 V (ac) (100/200 V system automatic change), 50 Hz / 60 Hz ≤500 VA
Operational Temperature and Humidity	5° to 40°C, 20 to 80%
Dimensions and Mass	320 (W) × 221 (H) × 350 (D) mm, ≤14 kg (without plug-in units)

■ MU150140A 40/43G Unit

Frame	39,813.12 Mbit/s: SDH/SONET
No Frame	39,813.12 Mbit/s
Test Pattern	PRBS (SDH/SONET) No Frame: $2^7 - 1, 2^{15} - 1, 2^{23} - 1, 2^{31} - 1$ SDH/SONET Mapping: $2^{15} - 1, 2^{23} - 1, 2^{31} - 1$ PDH Mapping: $2^{11} - 1, 2^{20} - 1, 2^{20} - 1z$ Invert On/Off Word: VC4 × 256c: 32-bit Programmable (including All 0, All 1) Others: 16-bit Programmable (including All 0, All 1)
OH Preset	SOH/TOH/POH: All Bytes (except Parity Byte, K1/K2 Byte, H1, H2 and H3) Dummy Channel POH: All Bytes (except Parity Byte)
Error Addition/ Measurement	<SDH> Bit all, FAS, B1, B2, MS-REI (M0/M1), HP-B3, HP-REI, HP-IEC, HP-TC-REI, HP-OEI, LP-B3, BIP-2, LP-REI, LP-IEC, N2-BIP-2, LP-TC-REI, LP-OEI Bit info <SONET> Bit all, FAS, B1, B2, REI-L (M0/M1), B3-P, REI-P, IEC-P, TC-REI-P, OEI-P, B3-V, BIP-2, REI-V, IEC-V, Z6-BIP-2, TC-REI-V, OEI-V Bit info
Error Addition Timing	Rate, Alternative, Single, Burst, All, Frame Rate Fix Rate: 1×10^{-n} (n: 3 to 9), User Program: $A \times 10^{-B}$ (A: 1.0 to 9.9/0.1 step, B: 2 to 10) Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000 Frame (only PDH/DSn): n in 16 Frame (n: 1 to 4) B1, B2, B3, BIP-2 set as Error Bit.
Alarm Addition/ Measurement	<SDH> LOF, RS-TIM (Timing: All only), MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-SLM, HP-TIM (Timing: All only), HP-RDI, HP-UNEQ, HP-ERDIP, HP-ERDIS, HP-ERDIC, HP-VC-AIS, HP-Incoming AIS, HP-TC-RDI, HP-ODI, HP-TCUNEQ, HP-TCTIM (Timing: All only), HP-LTC, TU-AIS, TU-LOP, TU-LOM, LP-SLM, LP-TIM (Timing: All only), LP-RDI, LP-UNEQ, LP-ERDIP, LP-ERDIS, LP-ERDIC, LP-RFI, LP-VC-AIS, LP-Incoming AIS, LP-TC-RDI, LP-ODI, LP-TCUNEQ, LP-TCTIM (Timing: All only), LP-LTC <SONET> LOF, RS-TIM (Timing: All only), AIS-L, RDI-L, AIS-P, LOP-P, SLM-P, TIM-P (Timing: All only), RDI-P, UNEQ-P, ERDIP-P, ERDIS-P, ERDIC-P, STS-VC-AIS, Incoming AIS-P, TC-RDI-P, ODI-P, TCUNEQ-P, TCTIM-P (Timing: All only), LTC-P, AIS-V, LOP-V, LOM-V, SLM-V, TIM-V (Timing: All only), RDI-V, UNEQ-V, ERDIP-V, ERDIS-V, ERDIC-V, RFI-V, VC-AIS-V, Incoming AIS-V, TC-RDI-V, ODI-V, TCUNEQ-V, TCTIM-V (Timing: All only), LTC-V
Alarm Addition Timing	Single, Burst, Alternative, All Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000
10G Date Input	Bit Rate: 9,953.28 Mbit/s ±30 ppm Code: NRZ Connector: SMA 50 Ω Level: 0.3 to 1.5 Vp-p
10G Date Output	Bit Rate: 9,953.28 Mbit/s Code: NRZ Connector: SMA 50 Ω Level: 0.71 Vp-p ±0.08 V
Clock	Internal, Receive Internal Accuracy: ±2 ppm [After Power On, Calibrate after 24 Hours, Warm-up 23 ±5°C, Aging Rate (Max.): ±0.05 ppm/day, ±0.5 ppm/year] Offset Range: ±30 ppm, Step: 0.1 ppm

Monitor	SDH/SONET: SOH/TOH/POH, Path Trace, Tandem Byte, K1/K2 Byte, AU/STS, TU/VT Pointer
Through	Transparent, Overhead Overwrite (Only SDH/SONET/OTN)
Delay Measurement	Measurement Period: 0.5, 1, 2, 5, 10 s Measurement Range: 0 to 999 μ s (1 μ s step), 1.0 ms to 999.9 ms (0.1 ms step), 1.0 s to 10.0 s (0.1 s step), >Time Out
Dummy Channel	Mode: Copy/Dummy Dummy Pattern: All 0, All 1, $2^{11} - 1$, $2^{15} - 1$ (Invert)
Path Trace	J0, J1, J2 Byte can be set arbitrarily. 16 byte (CRC On), 64 byte (CRC Off, J1 Only)
Tandem Connection	N1/Z5, N2 Byte can be set arbitrarily. It can set On/Off
Pointer Generation	AU/STS, TU/VT Pointer Action: NDF, \pm PJ (Pointer Justification), Inc./Dec. PJC Timing: Manual, Burst (2 to 64) Inc./Dec. Timing: 4 to 8000 Frame
APS Test	Trigger: B1, B2, HP-B3, LP-B3, BIP-2, MS-AIS/AIS-L, AU-AIS/AIS-P, TU-AIS/AIS-V, BIT, External Range: 2 s Step: 0.1 ms
Frame Memory (MU150140A-10)	Mapping: STM-256c/STS-768c, OTU3* Number of Frames: STM-256c/STS-768c: 1 to 16 frames OTU3: 1 to 256 frames* Frame Data: All bytes without B1, B2, HP-B3, Pointer
Frame Capture (MU150140A-10)	Mapping: STM-256c/STS-768c, OTU3* Capture Frame: STM-256c/STS-768c: 1 to 16 frames OTU3: 1 to 256 frames* Trigger: B1, B2, MS-REI/REI-L, MS-AIS/AIS-L, MS-RDI/RDI/RDI-L AU/STS+PJC, AU/STS-PJC, AU/STS NDF AU/STS Cons., External, Manual Trigger Position: Top, Middle, Bottom

*: Requires separate MU150140A-05 OTU3 option for OTU3 mapping.



MU150140A

Configuration Examples

40G Optical (NRZ)

1	
2	
3	
4	MU150141A
5	MU150140A
6	

40/43G Optical (NRZ)

1	
2	
3	
4	MU150141B
5	MU150140A
6	

Multi Bitrate

1	
2	MU150100A
3	MU150135A
4	MU150141B
5	MU150140A
6	

- Slot 4 adds two extra slots.

■ MU150140A-05 OTU3

■ MU150140A-06 OTDU23

Option	MU150140A-05	MU150140A-06*
Bite Rate	43,018.413 Mbit/s	
Mapping	OTU3	ODTU23
No Frame	43,018.413 Mbit/s	
Test Pattern	No Frame: PRBS: $2^7 - 1$, $2^{15} - 1$, $2^{23} - 1$, $2^{31} - 1$ STM-256/STS-768 Mapping: SDH/SONET Mapping NULL Mapping: A110 PRBS Mapping: PRBS: $2^{15} - 1$, $2^{23} - 1$, $2^{31} - 1$ Word: 32-bit Programmable (including All 0, All 1) Invert On/Off Tx/Rx can be set independently	STM-64/STS-192 Mapping: SDH/SONET Mapping NULL Mapping: A110 PRBS Mapping: PRBS: $2^{15} - 1$, $2^{23} - 1$, $2^{31} - 1$ Word: 16-bit Programmable (including All 0, All 1) Invert On/Off Tx/Rx can be set independently
OH Preset	OTU, ODU, OPU, FAS (except Parity Byte) TTI (SPAI [1] - [15], DAPI [1] - [15]) can be set character. PT is automatically set according to mapping (can be edited).	
FEC	G.709, RS (255, 239) FEC can be turned On/Off.	
Justification	Generation Action: \pm Justification Timing: Single, Burst (1 to 64) Measurement Item: +JC, -JC, +2JC (OPU3), +JC, -JC (OPU2)	
Payload Offset	At OPU3, Async Mapping: -95.8 to +101.1/0.1 ppm step At OPU2, Async Mapping: -65.6 to +65.6/0.1 ppm step	
Error Addition/ Measurement	FAS, BIP-8 (SM, PM, TCM1-6), BEI (SM, PM, TCM1-6), Bit All (Only OTU), Bit, Corrected Error Bit (Only Measurement), Uncorrectable FEC Block (Only Measurement)	
Error Addition Timing	Single, Rate, All, Alternate, Random (Only Bit All), Single Burst (Only Bit All), Continuous Burst (Only Bit All) Rate Fix Rate: 1×10^{-n} (n: 3 to 9), User Program: $A \times 10^{-B}$ (A: 1.0 to 9.9, B: 2 to 10) Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000 Random Poisson distribution error insertion Single Burst Bit error with set count (1 to 4095) inserted once Continuous Burst Bit error with set count (1 to 4095) inserted as burst at 1 ms intervals When the Parity Error is set, it can be selected Error Position	
Alarm Addition/ Measurement	LOF, OOF (Only Measurement), LOM, OOM (Only Measurement), BDI (SM, PM, TCM1-6), AIS (OTU, ODU), ODU-OCI, ODU-LCK, ODU-PLM (Only Measurement), IAE (SM, TCM1-6), TIM (SM, PM, TCM1-6), LTC (TCM1-6), BIAE (SM, TCM1-6)	
Alarm Addition Timing	Alternative, All, Burst, Single Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000	
Monitor	All OH (OTU, ODU, OPU), TTI, FTFL, Payload	
Overhead Sequence Capture	Capture Byte: APS/PCC Size: 64 Sequence Repeat: Max. 8000 Frame/Sequence	
Overhead Test	OTU/ODU/OPU 1 Byte, FAS, APS/PCC, TCM1-6, SM, PM, GCC0-2, EXP (except Parity Byte, MFAS and JC, NJO Byte) Timing: Alternative (A: 1 to 8000 Times, B: 1 to 8000 Times), A and B can be set up to 256 Frames.	
OH/BERTS Test	GCC0-2, OH 1 Byte (except Parity Byte) Pattern: $2^{11} - 1$, $2^{15} - 1$ (Invert) Error Addition: Bit (Only Single) Measurement: Bit Error, Sync.Loss	

*: Requires separate MU150140-05 OTU3 option.

■ MU150141A 40G Optical Unit

■ MU150141B 40/43G Optical Unit

Model	MU150141A	MU150141B
Bit Rate	39,813.120 Mbit/s	39,813.120 Mbit/s, 43,018.413 Mbit/s*1
Optical Output	Wavelength: 1530 nm to 1565 nm Side-mode Suppression Ratio: ≥35 dB Optical Output Power: 0 to +3 dBm Signal Code: NRZ Connector: FC-PC, replaceable	
Optical Input	Wavelength: 1530 nm to 1565 nm Receiver Sensitivity: ≥-6 dBm Receiver Overload: +3 dBm Signal Code: NRZ Return loss: ≥27 dB Connector: FC-PC, replaceable	
LOS	Insert, Detect	
Power Meter	Measurement range: -6 to +3 dBm Accuracy: ±2 dB	
Laser Safety	IEC 60825-1: 2007: CLASS 1 21CFR1040.10*2	

*1: Requires separate MU150140-05 OTU3 option for 43G.

*2: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

Safety measures for laser products

This product complies with optical safety standards in 21CFR1040.10 and IEC 60825-1; the following descriptive labels are affixed to the product.



MU150141B

■ MU150100A 10/10.7G Unit

Electrical Interface (1.544 Mbit/s to 155.52 Mbit/s)	<p>Bit Rate PDH/DSn: 1.544 Mbit/s, 2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s, 44.736 Mbit/s, 139.264 Mbit/s SDH/SONET: 51.84 Mbit/s, 155.52 Mbit/s</p> <p>Code 1.544 Mbit/s: AMI/B8ZS 2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s: HDB3 44.736 Mbit/s, 51.84 Mbit/s: B3ZS 139.264 Mbit/s, 155.52 Mbit/s: CMI</p> <p>Connector 1.544 Mbit/s: BANTAM 100 Ω Balanced 2.048 Mbit/s: 3 pin Siemens 120 Ω Balanced 2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s, 44.736 Mbit/s, 51.84 Mbit/s, 139.264 Mbit/s, 155.52 Mbit/s: BNC 75 Ω</p> <p>Level ANSI T1.102 (1.544 Mbit/s, 44.736 Mbit/s) ITU-T G.703 (2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s, 139.264 Mbit/s) DSX Output (1.544 Mbit/s): 0/655 feet DSX Output (44.736 Mbit/s, 51.84 Mbit/s): 0/450/900 feet</p> <p>Monitor Gain 20 dB, 26 dB: 1.544 Mbit/s, 2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s, 44.736 Mbit/s, 51.84 Mbit/s 20 dB: 139.264 Mbit/s, 155.52 Mbit/s</p>
Electrical Interface (9953.28 M, 10312.5 M, 10709.225 Mbit/s)	<p>Bit Rate SDH/SONET: 9953.28 Mbit/s 10.3 G: 10312.5 Mbit/s (MU150100A-08) OTN: 10709.225 Mbit/s (MU150100A-05)</p> <p>Code: NRZ Connector: SMA 50 Ω</p> <p>Level Clock Output: 0.6 to 1.3 Vp-p Data Output: -0.2 to 0 V (High), -1.5 to -0.85 V (Low) Data Input: 0.3 to 1.5 Vp-p</p>

Optical Interface	Bit Rate SDH/SONET: 51.84 Mbit/s, 155.52 Mbit/s, 622.08 Mbit/s, 2488.32 Mbit/s OTN: 2666.057 Mbit/s (MU150100A-05) Code: NRZ Connector: FC-PC (SMF), Replaceable	
Optical Output	Level: -1 to +3 dBm (ATT = 0 dB, MU150100A-04) Extinction Ratio: ≥10 dB SMSR: ≥30 dB Peak Wavelength: 1550 ±20 nm (MU150100A-02, 03), 1310 ±20 nm (MU150100A-01, 03) -20 dB Width: ≤1 nm (@20 dB)	
Optical Input	Optical Input Level: -33 to -8 dBm (51.84 Mbit/s, 155.52 Mbit/s), -29 to -8 dBm (622.08 Mbit/s, 2488.32 Mbit/s, 2666.057 Mbit/s) Wavelength: 1260 nm to 1610 nm Overload: +3 dBm (average)	
Clock	Internal, External (Reference Input, 1/1 Input), Receive Internal Accuracy: ±0.1 ppm (After power-on, calibrated after 24 hours, warm-up at 23° ±5°C, aging rate (Max.): ±0.05 ppm/day, ±0.5 ppm/year) Offset Range: ±100 ppm, Step: 0.1 ppm	
Frame	1.544 Mbit/s: D4/ESF/Japan ESF 2.048 Mbit/s: 30, 31ch with or without CRC4 8.448 Mbit/s: G.742 34.368 Mbit/s: G.751 44.736 Mbit/s: M13/C-bit 139.264 Mbit/s: G.751	51.84 Mbit/s: SDH/SONET 155.52 Mbit/s: SDH/SONET 622.08 Mbit/s: SDH/SONET 2488.32 Mbit/s: SDH/SONET 9953.28 Mbit/s: SDH/SONET
No Frame	1.544, 2.048, 8.448, 34.368, 44.736, 139.264 Mbit/s 51.84, 155.52, 622.08, 2488.32, 9953.28 Mbit/s	
Test Pattern	PRBS, Word, All 0, All 1, 3 in 24 (1.544 Mbit/s only) PRBS (SDH/SONET) No Frame: $2^{15} - 1$ (51.84 Mbit/s, 155.52 Mbit/s only), $2^{23} - 1$, $2^{31} - 1$ Concatenation Mapping: $2^{15} - 1$ (1c/4c), $2^{23} - 1$, $2^{31} - 1$ Other Mapping: $2^{11} - 1$, $2^{15} - 1$, $2^{20} - 1$, $2^{20} - 1z$ (1.5M/45M only), $2^{23} - 1$ Invert On/Off PRBS (PDH/DSn) $2^{11} - 1$, $2^{15} - 1$, $2^{20} - 1$, $2^{20} - 1z$ (1.544 Mbit/s, 44.736 Mbit/s only), $2^{23} - 1$ Invert On/Off Word: 16-bit Programmable (Mark Ratio 1/2 at No Frame) Transmit/Receive: Independent setup supported	
Overhead Preset	SOH/TOH/POH: All Bytes (except Parity Byte, K1/K2 Byte and H1/H2/H3 Byte) Dummy Channel POH: All Bytes (except Parity Byte)	
Error Addition/ Measurement	PDH/DSn Bit All (Only Addition), Code, Bit Info, Bit 1.5M, Bit 2M, Bit 8M, Bit 34M, Bit 45M, Bit 139M, FAS 1.5M, FAS 2M, FAS 8M, FAS 34M, FAS 45M, FAS 139M, EXZ, CRC6, Ebit, Parity, Cbit, REI SDH FAS, Frame (Measurement only), B1, B2, HP-B3, LP-B3, BIP-2, MS-REI (M0/M1), HP-REI, LP-REI, Bit All (Only Addition), Bit Info, OH Bit, HP-IEC, LP-IEC, N2 BIP-2, HP-TC-REI, LP-TC-REI, HP-OEI, LP-OEI SONET FAS, Frame (Measurement only), B1, B2, HP-B3, LP-B3, BIP-2, REI-L (M0/M1), REI-P, REI-V, Bit All (Only Addition), Bit Info, OH Bit, HP-IEC, LP-IEC, N2 BIP-2, HP-TC-REI, LP-TC-REI, HP-OEI, LP-OEI	
Error Addition Timing	Rate, Alternative, Single, Burst, All, Frame Rate Fix Rate: 1×10^{-n} (n: 3 to 9), User Program: $A \times 10^{-B}$ (A: 1.0 to 9.9, step 0.1, B: 2 to 10) Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000 Frame (only at PDH/DSn): Insert n Error Frames (n: 1 to 4) in 16 frames Specify insertion bit position at B1, B2, B3, BIP-2 error insertion	
Alarm Addition/ Measurement	PDH/DSn: LOS, LOF, AIS, RDI, RDI (MF) SDH: LOS, LOF, OOF (Measurement only), RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-ERDIP, HP-ERDIS, HP-ERDIC, HP-TIM, HP-UNEQ, HP-SLM, TU-AIS, TU-LOP, TU-LOM, LP-RDI, LP-ERDIP, LP-ERDIS, LP-ERDIC, ISF, LP-RFI, LP-TIM, LP-UNEQ, LP-SLM, Sync. loss, OH Sync., HP-VC-AIS, LP-VC-AIS, HP-FAS, LP-FAS, HP-Incoming AIS, LP-Incoming AIS, HP-TC-RDI, LP-TC-RDI, HP-ODI, LP-ODI, HP-TC-TIM, LP-TC-TIM, HP-LTC, LP-LTC SONET: LOS, LOF, OOF (Measurement only), RS-TIM, AIS-L, RDI-L, AIS-P, LOP-P, RDI-P, ERDIP-P, ERDIS-P, ERDIC-P, TIM-P, UNEQ-P, PLM-P, AIS-V, LOP-V, LOM-V, RDI-V, ERDIP-V, ERDIS-V, ERDIC-V, ISF, RFI-V, TIM-V, UNEQ-V, PLM-V, Sync. loss, OH Sync., HP-VC-AIS, LP-VC-AIS, HP-FAS, LP-FAS, HP-Incoming AIS, LP-Incoming AIS, HP-TC-RDI, LP-TC-RDI, HP-ODI, LP-ODI, HP-TC-TIM, LP-TCTIM, HP-LTC, LP-LTC	
Alarm Addition Timing	Single, Burst, Alternative, All Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000	
Monitor	PDH/DSn: FAS 1.5M, FW 2M, NFW 2M, MFW 2M, FAS 8M, FAS 34M, FAS 45M, FAS 139M, Info Byte (2M only) SDH/SONET: SOH/TOH/POH, Path Trace, Tandem Byte, AU/STS, TU/VT Pointer, Payload	
Through	Transparent, Overhead Overwrite (SDH/SONET/OTN only)	
MUX/DEMUX	MUX/DEMUX supported to 64 k units in PDH and DSn	
Add/Drop (MU150100A-09)	STM-0/1/4/16 or OC-1/3/12/48 signal added to or dropped from STM-64 or OC-192 signal	

Delay Measurement	Measurement Period: 0.5, 1, 2, 5, 10 s Measurement Range: 0. to 999 μ s (1 μ s step), 1.0 ms to 999.9 ms (0.1 ms step), 1.0 s to 10.0 s (0.1 s step), > Time Out
Dummy Channel	Mode: Copy/Dummy Dummy Pattern: All 0, All 1, PRBS $2^{11} - 1$, PRBS $2^{15} - 1$ (Invert)
Path Trace	J0, J1, J2 Byte set arbitrarily 16 bytes (CRC On), 64 bytes (CRC Off, J1 only)
Tandem Connection	N1/Z5, N2 Byte set arbitrarily Set On/Off
Pointer Generation	AU/STS, TU/VT Pointer Action: NDF, \pm PJ (Pointer Justification), Inc./Dec. PJC Timing: Manual, Burst (2 to 64), Inc./Dec. Timing: 4 to 8000 Frames
Pointer Measurement	AU/STS, TU/VT Pointer, C Bit Measurement Item: NDF, +PJC, -PJC, Cons, C, C1/C2
Payload Offset	Offset Range: \pm 100 ppm/0.1 ppm step set at Async Mapping
APS Test	Switching Time Measurement Measurement Time: 0.1 ms to 2000.0 ms, Timeout (exclude Time for Frame/Pointer Synchronization) APS Sequence Generator Generator Timing: 2 to 64 words, Max. 8000 frames/words Set for K1/K2, K3, K4 Byte
Overhead Sequence Capture	Capture Byte: K1/K2, K3, K4, AU/STS Pointer, TU/VT Pointer Size: 64 Sequence Repeat: Max. 8000 Frame/Sequence
Overhead Test	SOH/TOH/POH 1 Byte, A1/A2, K1/K2, RSOH, MSOH, SOH, POH (except Parity Byte, K1/K2 Byte and H1/H2/H3 Byte) Timing: Alternative (A: 1 to 8000 Times, B: 1 to 8000 Times), A and B can be set up to 256 frames.
Overhead BERT Test	Test Byte: SOH/TOH/POH 1 Byte, D1-D3, D4-D12 (except Parity Byte, K1/K2 Byte and H1/H2/H3 Byte) Pattern: PRBS $2^{11} - 1$, PRBS $2^{15} - 1$ (Invert) Error Addition: Bit (Only Single) Measurement: Bit Error, Sync Loss
Overhead Add/Drop	Test Byte: D1-D3, D4-D12
Error Performance	G.821, G.826, G.828, G.829, M.2100, M.2101, M.2110, M.2120, GR.820
Optical Power Meter	Wavelength: 1310 nm/1550 nm Measurement Range: -40 to -7 dBm Measurement Accuracy: \pm 1 dB (-30 to -10 dBm), \pm 2 dB (-9.9 to -7 dBm, -40 to -30.1 dBm)
Frequency Counter	Measurement Frequency (f0): 1.544, 2.048, 8.448, 34.368, 44.736, 51.84, 139.264, 155.52, 622.08, 2488.320, 2666.057, 9953.28, 10709.225 MHz Measurement Range: f0 \pm 100 ppm Accuracy: \pm 0.1 ppm
Auxiliary Interface	External Clock Input, Receive Clock Output, Clock/Frame Sync. Output
Optical Output Power Adjustable (MU150100A-04)	Variable Range: 0 to 30 dB Accuracy: \leq \pm 0.5 dB (0 to 10 dB), \leq \pm 1.0 dB (10.1 to 30 dB) Setting Resolution: 0.1 dB
Laser Safety	IEC 60825-1: 2007: CLASS 1 21CFR1040.10*

*: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

Safety measures for laser products

This product complies with optical safety standards in 21CFR1040.10 and IEC 60825-1; the following descriptive labels are affixed to the product.



MU150100A

■ MU150100A-05 OTU1/OTU2

Bite Rate	10709.225 Mbit/s, 2666.057 Mbit/s
Frame	10709.225 Mbit/s: OTU2, 2666.057 Mbit/s: OTU1
No Frame	10709.225 Mbit/s, 2666.057 Mbit/s
Test Pattern	PRBS, Word, All 0, All 1 PRBS No Frame: $2^{15} - 1, 2^{23} - 1, 2^{31} - 1$ PRBS Mapping: $2^{15} - 1, 2^{23} - 1, 2^{31} - 1$ SDH/SONET Mapping: According to SDH/SONET Mapping Invert On/Off Word: 16-bit Programmable (Mark Ratio 1/2 at No Frame) Transmit/Receive: An independent setup is possible
Overhead Preset	OTU, ODU, OPU, FAS (except Parity Byte, MFAS and JC Byte) TTI (SPAI [1] - [15], DAPI [1] - [15]) can be set character. PT is set automatically according to mapping (can be edit).
FEC	G.709, RS (255, 239) On/Off
Justification	Generation Action: \pm Justification Timing: Single, Burst (2 to 64) Measurement Item: + JC, -JC
Payload Offset	Offset Range: ± 65.9 ppm/0.1 ppm step set at Async. Mapping.
Error Addition/ Measurement	FAS, BIP-8 (SM, PM, TCM1-6), BEI (SM, PM, TCM1-6), Bit All (Addition for OTN Frame only), Bit, Corrected Error Bit (Measurement only), Uncorrectable FEC Block (Measurement only)
Error Addition Timing	Single, Rate, All, Alternate, Random (Only Bit All) Rate Fix Rate: 1×10^{-n} (n: 3 to 9), User Program: $A \times 10^{-B}$ (A: 1.0 to 9.9, B: 2 to 10) Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000 Random: Poisson distributed error insertion (only at Bit all) Specify insertion bit position at parity error insertion
Alarm Addition/ Measurement	LOF, OOF (Measurement only), LOM, OOM (Measurement only), BDI (SM, PM, TCM1-6), AIS (OTU, ODU, ODU-OCI, ODU-LCK, ODU-PLM (Measurement only), IAE (SM, TCM1-6), TIM (SM, PM, TCM1-6), LTC (TCM1-6), BIAE (SM, TCM1-6)
Alarm Addition Timing	Alternative, All, Burst, Single Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000
Monitor	All OH (OTU, ODU, OPU), TTI, FTFL, Payload Multi-frame supported of TTI and FTFL.
Overhead Sequence Capture	Capture Byte: APS/PCC Size: 64 Sequence Repeat: Max. 8000 Frames/Sequence
Overhead Test	OTU/ODU/OPU 1 Byte, FAS, APS/PCC, TCM1-6, SM, PM, GCC0-2, EXP (except Parity Byte, MFAS and JC Byte) Timing: Alternative (A: 1 to 8000 times, B: 1 to 8000 times), A and B set up to 256 frames
Overhead BERT Test	GCC0-2, OH 1 Byte (except Parity Byte) Pattern: PRBS $2^{11} - 1$, PRBS $2^{15} - 1$ (Invert) Error Addition: Bit (Only Single) Measurement: Bit Error, Sync Loss
Overhead Add/Drop	Test Byte: GCC0-2

■ MU150100A-07 10/10.7G Minus Option

Function	Removes 10/10.7G Electrical Capability from MU150100A. Factory installed option
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Cannot be installed when Insert/Extract option (MU150100A-09) installed

■ MU150100A-08 10.3G

Bit Rate (No Frame)	10312.5 Mbit/s	
Test Pattern	PRBS, Word, All 0, All 1 PRBS No Frame: $2^{15} - 1$, $2^{23} - 1$, $2^{31} - 1$ Invert: On/Off	Word: 16-bit Programmable (Mark Ratio 1/2) Transmit/Receive: Supports independent setup
Alarm/Error Addition/ Measurement	Bit All (Addition), Bit Sync Loss (Measurement)	
Error Addition Timing	Single, Rate, All, Alternate Rate Fix Rate: 1×10^{-n} (n: 3 to 9), User Program: $A \times 10^{-B}$ (A: 1.0 to 9.9, B: 2 to 10) Alternative Error Frame: 0 to 64000, Normal Frame: 1 to 64000	
Clock	External (1/1 Input)	

■ MU150135A 10/10.7G Optical Unit (XFP)

XFP	G0194A 1310 nm XFP Module	G0195A 1550 nm XFP Module
Bit Rate	9953.28 Mbit/s \pm 100 ppm, 10312.5 Mbit/s \pm 100 ppm, 10709.225 Mbit/s \pm 100 ppm	
Optical Input	Wavelength: 1260 nm to 1355 nm Sensitivity: -11 dBm (9953.28, 10709.225 Mbit/s) -10.3 dBm (10312.5 Mbit/s) Absolute Maximum Optical Input: 0.5 dBm (average) Code: NRZ Return Loss: \geq 12 dB Connector: LC-PC	Wavelength: 1260 nm to 1580 nm Sensitivity: -14 dBm (9953.28, 10709.225 Mbit/s) -11.3 dBm (10312.5 Mbit/s) Absolute Maximum Optical Input: -1 dBm (average) Code: NRZ Return Loss: \geq 12 dB Connector: LC-PC
Optical Output	Peak Wavelength: 1290 nm to 1330 nm (Typ. 1310 nm) Spectrum Width: \leq 1 nm (@ -20 dB) SMSR: \geq 30 dB Extinction Ratio: \geq 6 dB Level: -6 to -1 dBm Code: NRZ Connector: LC-PC	Peak Wavelength: 1530 nm to 1565 nm (Typ. 1550 nm) Spectrum Width: \leq 1 nm (@ -20 dB) SMSR: \geq 30 dB Extinction Ratio: \geq 8.2 dB Level: -1 to +2 dBm Code: NRZ Connector: LC-PC
Electrical Input	Input Level: 0.65 to 1.5 Vp-p Code: NRZ Connector: SMA, 50 Ω (AC)	
Electrical Output	Output Level: 0.5 to 0.7 Vp-p Code: NRZ Connector: SMA, 50 Ω (AC)	
Mounting Times	100 max.	
Laser Safety	IEC 60825-1: 2007: CLASS 1 21CFR1040.10*	

*: Excludes deviations caused by conformance to Laser Notice No. 50 dated June 24, 2007

Safety measures for laser products

This product complies with optical safety standards in 21CFR1040.10 and IEC 60825-1; the following descriptive labels are affixed to the product.



MU150135A



Ordering Information

Please specify the model/order number, name and quantity when ordering.
The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Model/Order No.	Name
MP1595A	-Main Frame- 40G SDH/SONET Analyzer
	-Standard Accessories-
J0491	Shield Power Cord 2.6 m (13 A)* ¹ : 1 pc
J0670A	Power Cord L Type (C7), 2.5 m* ¹ : 1 pc
F0105	Fuse 10 A* ¹ : 2 pcs
B0482	Front Cover (3/4MW5U)* ¹ : 1 pc
J1003S	Semirigid Cable, 56.5 mm* ² , * ³ : 1 pc
J1003N	Semirigid Cable, 136.6 mm* ² : 1 pc
J0635A	Optical Fiber Cable (SM, FC-SPC connector both ends), 1 m* ⁴ : 1 pc
J0617B	Replaceable Optical Connector (FC-PC)* ³ , * ⁴ : 2 pcs
J1383A	Semirigid Cable, 105.7 mm* ⁵ : 1 pc
J1384A	Semirigid Cable, 90.0 mm* ⁵ : 1 pc
J0747C	Fixed Optical Attenuator (15 dB, FC connector)* ³ : 1 pc
	-Units/Modules-
MU150100A	10/10.7G Unit* ⁶
MU150135A	10/10.7G Optical Unit (XFP)* ⁷
MU150140A	40/43G Unit
MU150141A	40G Optical Unit
MU150141B	40/43G Optical Unit
	-Software-
MX159501A	40G SDH/SONET Analyzer Control Software
	-Option-
MP1595A-01	RS-232C
MP1595A-02	GPIO
MP1595A-03	LAN
MU150140A-05	OTU3
MU150140A-06	ODTU23* ⁸
MU150140A-10	Frame Memory/Capture (40/43G)
MU150141A-40	SC Connector
MU150141B-40	SC Connector
MU150100A-01	Wavelength 1.31 μm
MU150100A-02	Wavelength 1.55 μm
MU150100A-03	Wavelength 1.31/1.55 μm
MU150100A-04	Optical Output Power Adjustable
MU150100A-05	OTU1/OTU2
MU150100A-07	10/10.7G Minus Option* ⁹
MU150100A-08	10.3G* ¹⁰
MU150100A-09	Insert/Extract* ⁹
MU150100A-38	ST Connector* ¹¹
MU150100A-39	DIN Connector* ¹¹
MU150100A-40	SC Connector* ¹¹
MU150100A-43	HMS-10/A Connector* ¹¹
	-Optional Accessories-
B0483	Carrying Case
B0593A	Blank Panel
G0194A	1310 nm XFP Module* ¹²
G0195A	1550 nm XFP Module* ¹²
J0008	GPIO cable, 2 m
J0845	Balanced Cable (BANTAM 3P-BANTAM 3P), 6 ft
J0162A	Balanced Cable (Siemens 3P-Siemens 3P), 1 m
J0162B	Balanced Cable (Siemens 3P-Siemens 3P), 2 m
J0322B	Coaxial Cable (11SMA SUCOFLEX104 11SMA), 1 m
J0617B	Replaceable Optical Connector (FC-PC)
J0635B	Optical Fiber Cable (SM, FC-SPC connector both ends), 2 m
J0635C	Optical Fiber Cable (SM, FC-SPC connector both ends), 3 m
J0660B	Optical Fiber Cable (SM, SC-SC connector both ends), 2 m
J0747A	Fixed Optical Attenuator (5 dB, FC connector)
J0747B	Fixed Optical Attenuator (10 dB, FC connector)
J0747C	Fixed Optical Attenuator (15 dB, FC connector)
J0747D	Fixed Optical Attenuator (20 dB, FC connector)

Model/Order No.	Name
J0775D	Coaxial cable (BNC-P620 3C-2WS BNC-P620 75 Ω), 2 m
J0776D	Coaxial cable (BNC-P-3W/3D-2W/BNC-P-3W, 50 Ω), 2 m
J0796A	ST Connector (replaceable, with protective caps, 1 set)
J0796B	DIN Connector (replaceable, with protective caps, 1 set)
J0796C	SC Connector (replaceable, with protective caps, 1 set)
J0796D	HMS-10/A Connector (replaceable, with protective caps, 1 set)
J0796E	FC Connector (replaceable, with protective caps, 1 set)
J1003S	Semirigid Cable, 56.5 mm
J1003N	Semirigid Cable, 136.6 mm
J1049A	Fixed Optical Attenuator (5 dB, SC connector)
J1139A	Optical Fiber Cable (SM, FC-LC connector both ends), 1 m
J1271	Optical Fiber Cable (Duplex, SM, LC-LC connector), 2 m
J1272	Optical Fiber Cable (Duplex, SM, LC-SC connector), 2 m
J1327B	Optical Fiber Cable (SM, LC-LC connector both ends), 2 m
J1344A	Optical Fiber Cable (SM, LC-LC connector both ends), 1 m
J1139A	Optical Fiber Cable (SM, LC-FC connector both ends), 1 m
J1376A	Fixed Optical Attenuator (5 dB, LC connector)
J1383A	Semirigid Cable, 105.7 mm
J1384A	Semirigid Cable, 90.0 mm
Z0282	Ferrule Cleaner 1 CLETOP type
Z0283	Replacement Reels for Ferrule Cleaner 1 6/pack
Z0284	Adapter Cleaner 1 Stick type (200/set)
Z0321A	Keyboard (PS/2)
Z0541A	USB Mouse
Z0849A	MD1230/MP1590 Family Manual CD
Z0989A	1310 nm XFP Kit* ¹³
Z0990A	1550 nm XFP Kit* ¹⁴
W2869AE	MP1595A Operation Manual
W2937AE	MX159501A Operation SDH Edition Manual
W2938AE	MX159501A Operation SONET Edition Manual
W2939AE	MP1595A Remote Control Operation Manual
W2424AE	MU150100A Specifications Operation Manual
W2870AE	MU150135A Specifications Operation Manual
W2871AE	MU150140A Specifications Operation Manual
W2872AE	MU150141A/B Specifications Operation Manual

- *1: Supplied with main frame
- *2: Supplied with MU150140A
- *3: Supplied with MU150100A
- *4: Supplied with MU150141A or MU150141B
- *5: Supplied with MU150135A
- *6: One of Option-01, 02, 03 required.
- *7: Requires XFP module (sold separately).
In addition, operation with non-Anritsu modules not guaranteed.
- *8: Requires separate MU150140-05 OTU3 option.
- *9: MU150100A-07 factory installed only. MU150100A-07 and MU150100A-09 cannot both be installed simultaneously.
- *10: External clock source is required.
- *11: Exchangeable.
- *12: XFP modules sold as single units. One can be mounted in MU150135A.
- *13: Z0989A includes G0194A and J1344A.
- *14: Z0990A includes G0195A, J1344A, and J1376A.

Maintenance Service

Name	Model/Order No.
2 Years Extended Warranty Service	Option-ES210
3 Years Extended Warranty Service	Option-ES310
5 Years Extended Warranty Service	Option-ES510

*: These options extend the 1-year guarantee at purchase.



Note

• **United States**

Anritsu Company

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